Karluk Lake Sockeye Salmon Smolt Enumeration Project Operational Plan, 2013

by

Mary Loewen

April 2013

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

Sockeye salmon smolt enumeration projects have been conducted on Karluk River intermittently since the 1920s. In recent years, annual restrictions on the sockeye salmon *Oncorhynchus nerka* subsistence, sport, and commercial fishery were necessary in order to achieve escapement, since adult returns from 2008 to 2011 were the lowest since the early 1980s. In 2010, Alaska Department of Fish and Game (ADF&G) in conjunction with Kodiak Regional Aquaculture Association (KRAA) implemented pilot sockeye smolt sampling at Karluk Lake from late May to mid-June 2010 to detect possible causes between low adult returns and smolt age, size, and body condition. Begining in 2011, the Alaska Sustainable Salmon Fund provided funding to ADF&G and KRAA to complete three seasons of the Karluk Lake sockeye salmon smolt grab sampling study including stable isotope analysis. Additionally, more funding was secured by the State of Alaska to reinstitute a more permanent smolt outmigration enumeration project at Karluk Lake in 2012. In 2013, the continuation of both the enumeration project and stable isotope sampling project will be carried out. Using two Canadian Fan traps and mark-recapture techniques, emigrating population size will be estimated between May 12 and June 30, 2013. Sockeye salmon smolt caught in the traps will be sampled for age, size, condition, and isotopic signature. This operational plan provides the instruction and procedures to properly conduct the study.

Key words: Kodiak, sockeye salmon, *Oncorhynchus nerka*, smolt, Karluk, fyke net, Canadian fan trap, stable isotope.

INTRODUCTION

Karluk Lake is located on the southwest side of Kodiak Island (Figure 1), and supports the largest sockeye salmon *Oncorhynchus nerka* run in the Kodiak Management Area (Foster 2011). Some of the earliest recorded commercial harvests of sockeye salmon are from Karluk Lake, dating from the late 1800s (Bean 1891). In the early 1900s, sockeye salmon harvests and escapements at Karluk Lake were lightly regulated and overfishing was suspected to have occurred (Rounsefell 1958). A weir was established on the river in 1912 to enumerate escapement, and the White Act was implemented in 1924 to reserve 50% of the run for escapement. Despite these efforts, Karluk Lake sockeye salmon suffered a long-term decline in adult returns, and did not significantly increase until the late 1970s (Barnaby 1944; Schmidt et al. 1997; Schmidt et al. 1998).

From 1985 through 2007, Karluk sockeye salmon runs were consistently strong, averaging roughly 1.3 million sockeye salmon annually. Established early run upper escapement goals were exceeded 16 years in the 22 year period, and late run upper escapement goals were exceeded 8 years of the 22 year period. Sockeye salmon stocks in Karluk Lake experienced diminished adult returns from 2008 through 2011 which necessitated annual restrictions on the subsistence, sport, and commercial salmon fishery in order to conserve escapement.

From 2009 to 2011 a series of memorandums were written by the Alaska Department of Fish and Game (ADF&G) in Kodiak discussing the reasons for the low runs of sockeye salmon to Karluk Lake that began in 2008 and persisted through 2011. Trends in escapement, run size, limnology, climate, and fish size, age, and growth for Karluk Lake sockeye salmon were investigated. The authors emphasized the role that the increased age, small size and low body condition of outmigrating smolt in 2005, and especially in 2006, likely played in determining marine survival and subsequent run strength.

Extended freshwater residence for sockeye salmon often signifies decreased overall lake productivity and subsequent adult salmon returns (Foerster 1968). Sockeye salmon smolt studies have been conducted sporadically on Karluk Lake since 1925. Previous smolt projects were conducted on Karluk Lake during 1925–1936, 1961–1968, 1979–1992, 1994–1995, and 1997.

From 1999 to 2003, a smolt project was funded by the Kodiak Regional Aquaculture Association (KRAA) and implemented by ADF&G. The smolt project was continued from 2004 to 2006 as part of a larger project funded by the Gulf of Alaska Ecosystem Monitoring (GEM) program. The GEM project was a collaborative study between the University of Alaska and ADF&G to study the role of marine derived nutrients in the Karluk watershed, and both typical smolt age and size data were collected in addition to stable isotope sampling. In the last year of the study (2006) the average size of outmigrating sockeye was the smallest in the dataset stretching back to 1925. The Karluk sockeye smolt size was not only much smaller than normal in 2006, but the majority of the fish were freshwater age-3. The resultant ocean-age-2 sockeye salmon returning in 2008 marked the beginning of the reduced adult runs to Karluk. Historically, age-2. smolt have been the dominant outmigrating age class followed by age-3. (Kyle et al. 1988; Rounsefell 1958). While it has been found that lake residence time of Karluk sockeye salmon juveniles is longer than most systems, in 2009 the freshwater-age-3 component of the escapement was an unprecedented 90% (Koenings and Burkett 1987; Foster 2010).

In 2010, ADF&G and KRAA conducted grab sampling of outmigrating sockeye salmon smolt to estimate size and body condition factor at the outlet of Karluk Lake. Following the 2010 smolt sampling pilot project, ADF&G and KRAA successfully submitted a proposal to the Alaska Sustainable Salmon Fund (AKSSF). The Karluk sockeye salmon smolt project was funded for three years beginning in 2011. The project goal was to collect smolt age and size information from mid May to mid June at the outlet of Karluk Lake in 2011–2013. In 2012, the department was allocated funding to reinstitute the Karluk smolt enumeration project which had not been conducted since 2006, and an enumeration project was implemented alongside the AKSSF isotopic sampling project. In 2012, a total of 42 days of smolt trapping was achieved, using two Canadian fan traps and laying the groundwork for future seasons. The 2013 season again will be one in which the two different projects will work cooperatively to achieve the goals of both projects of sampling outmigrating smolt for age and size and estimating total smolt outmigration.

In addition, sockeye salmon smolt will be collected to expand the time series of stable isotope analyses that began in 1999. Stable isotope sampling is a way to assess the level of marine-derived nutrients in juvenile sockeye salmon (Finney et al. 2000). $\delta^{13}C$ analysis and C/N ratios provide an index of lipid content and thus fitness of fish and can be compared to calculated condition factor. The $\delta^{13}C$ ratios, once corrected for lipid contribution, provide another possible index of lake productivity.

The Karluk lake sockeye salmon smolt enumeration project will provide a comparable source of data to previous collections of smolt sampled at Karluk Lake. The average size of outmigrating age-2 and age-3 sockeye salmon smolt has a strong positive correlation with magnitude of total returns from an outmigration. A better understanding of the smolt age, size, condition, and isotopic signature may prove valuable in understanding overall Karluk Lake salmon production. This operational plan outlines the Karluk Lake sockeye salmon smolt enumeration project and the specific methods the smolt field crew will use in 2013 to collect data.

GOAL

The project goal is to assess the age, size, condition and abundance of sockeye salmon smolt outmigrating from Karluk Lake to increase understanding about population health in the system. Ultimately, documenting trends in smolt size and abundance will help in the development of forecasting models and escapement goal evaluations. Stable isotope analysis will help to assess

the level of marine-derived nutrients, trophic level differences between age classes, and fitness level of Karluk Lake sockeye salmon smolt.

OBJECTIVES

To achieve the project goal, project personnel will collect data to

1. Estimate the total number of emigrating sockeye salmon smolt, by age class, from Karluk Lake From May 10 to June 30;
2. Describe emigration timing and growth characteristics (length, weight, and condition factor), by age class for Karluk Lake sockeye salmon smolt. Sampling is such that the estimated mean weight of the major age class per strata will be within 5% and the mean length within 2% of the true value with 95% confidence (Thompson 1992);
3. Determine the stable isotopic composition ($\delta^{15}N$ and $\delta^{13}C$) of a subsample of juvenile sockeye salmon corresponding to the sampling in objective 1; and
4. Build a smolt database to estimate smolt-to-adult survival and to forecast future runs of Karluk sockeye salmon.

TASKS

1. Erect weatherport and set up field camp adjacent to lower trap site (0.5 km downstream of lake). Target dates May 6 to May 10.
2. Install and operate two Canadian fan traps to capture emigrating sockeye salmon smolt. Target dates May 10- May 14.
3. Enumerate catch by species.
4. Mark 1,000 sockeye salmon smolt weekly using Bismark Brown Y dye to estimate trap efficiency and the total smolt outmigration.
5. Collect physical data daily: air temperature, water temperature, water level, cloud coverage, wind direction and velocity, and precipitation.
6. Conduct weekly random sampling of 280 sockeye salmon smolt for age (scale samples), weight, and length.
7. Collect a maximum of 120 whole fish samples during the season and conduct stable isotope analysis.

PROJECT PERSONNEL

Project Biologists: *Mary Beth Loewen* – Lead Project Biologist ADF&G Karluk Smolt Emigration project– Westward Region Finfish Research Biologist

M. Birch Foster – Lead Project Biologist AKSSF Karluk Smolt Project – Westward Region Finfish Research Biologist.

Tina Fairbanks – KRAA Production/Operations – Collaborator for AKSSF Karluk Smolt Project

Dr. Bruce Finney – Professor of Science, Idaho State University – Lead for stable isotope analysis

Field Staff: *Vacant* – ADF&G Fish and Wildlife Tech III Field Project Leader

Vacant – ADF&G Fish and Wildlife Tech II

Vacant – KRAA Intern (AKSSF project)

Vacant – KRAA Intern (AKSSF project)

Ms. Loewen will oversee the project operations and coordinate tasks such that both the AKSSF project and ADF&G project goals are achieved. She will provide logistical and technical assistance, and write annual and final reports for the Karluk smolt enumeration project. Birch Foster will be responsible for all reporting requirements of the AKSSF funding. Bruce Finney will conduct all stable isotope analyses. The field project leader will coordinate day to day work schedules and assist with various aspects of the project as needed. The KRAA interns will assist the ADF&G technicians in the project during the peak 3 weeks of the outmigration. All field crew will implement the ADF&G safety guidelines, and ensure daily operations are conducted.

METHODS

SMOLT TRAP INSTALLATION, MONITORING, AND MAINTENANCE

Two Canadian fan traps will be fished in the Karluk River (Figure 2). The trap at the upper river site will be located approximately 125 meters downstream from the outlet of Karluk Lake on the east bank of the river, (Figure 2) and will be used for age, weight, and length (AWL) samples and smolt for recapture experiments. The trap at the lower river site will be located approximately 0.6 km downstream from the lake's outlet on the east bank of the river at the lower river site (Figure 2). The lower trap will be the primary location for AWL sample collection, enumeration of outmigrating fishes, and recapture of dyed smolt. Exact trap placement will be determined by the Project Biologist and may have to be adjusted throughout the season due to changes in stream velocity or water levels.

Trap locations will be recorded with a global positioning system (GPS). Additionally, after the initial setup, multiple digital pictures will be taken from different viewpoints and dimensions (trap and wings) will be recorded. It is important that the distance from the traps to the east and west river banks is measured and documented. Reference stakes will be driven on the bank at the leading edge of each trap; in addition permanent boulders in the river will be used to gauge river depth. Any change in the trap structure, such as additions or removal of perf plate on the wings, will be recorded in the crew logbook, with the new measurements of wing length and distance across the furthest upstream wing ends noted.

The traps will be installed so the water velocity is sufficient to force smolt into the catch box while ensuring that smolt are not injured (scale loss, pinned against the perforated sheeting, etc.). Perforated aluminum plate supported by a Rackmaster pipe frame will be installed as wings on either side of the trap to improve flow and increase capture efficiency. The upper trap will possess its own covered live box for holding fish designated for mark-recapture experiments, AWL sampling, and delayed mortality and mark retention tests. The lower trap will possess its own live box for retaining fish for AWL sampling.

The traps will:

- Be kept free of debris to maintain consistent trap efficiency and minimize smolt mortality;
- Require frequent monitoring and maintenance to ensure that they are working properly. The traps, when fishing, will be checked roughly every hour but may be checked more frequently depending on volume of catch, from sunset to sunrise. Additionally, Karluk smolt have been observed to emigrate in large numbers during daylight hours; the trap will be monitored a minimum of every three hours from sunrise to sunset;
- Be fished following the sampling protocol described in this operational plan from ~7 May until ~30 June. Attention to changes in migration patterns will be monitored and recorded; and
- Be modified or pulled from the water if conditions become dangerous or loss of equipment may occur. If this action is necessary, the project biologist will be notified as soon as possible.

SMOLT TRAP CATCH AND SPECIES ENUMERATION AT THE LOWER TRAP

The Canadian fan trap located at the lower river site will be fished continuously throughout the sampling season. A trapping day will be defined as a 24-hour period from NOON to NOON, with the date corresponding to the calendar date of the first 12-hour period. Time will be recorded in military (24-hour) format. Smolt behavior will be monitored as they approach and enter the mouth of the trap to qualitatively assess possible avoidance. To minimize smolt mortality, the trap will be checked roughly every hour between sunset and sunrise. The trap will be checked, cleaned, and emptied daily at noon. It is extremely important to monitor the traps closely because smolt outmigration rates are variable and unpredictable: excessive mortality can occur quickly if smolt are crowded in the trap. The traps will be kept clear of debris, as increased flows and detritus may cause death or injury to captured smolt.

Each time the trap is checked, all species will be identified and counted. A dip net will be used to remove and release the fish as they are counted. Smolt needed for sampling will be placed in a covered live-box. Various identification keys (e.g., Pollard et al. 1997; Appendix B) will be available and care will be taken to ensure proper identification. If identification by external characters proves difficult, a small number of fish will be sacrificed and internal characters will be examined. All fish of each species will be counted using a tally denominator to facilitate accuracy. Each time the trap is checked, all counts, including mortalities, will be recorded on the DAILY SMOLT CATCH REPORTING FORM (Figure 3). If it becomes necessary to count continuously because of high fish abundance, the tally will end for each species at the end of each hour. The data will be recorded, and a new tally will begin for the next hour. All counts will be summarized on the SOCKEYE SALMON SMOLT REPORTING FORM (Figure 4) on a daily basis.

If direct counting is impossible because of high smolt catches, it will be necessary to estimate the trap catch using the catch-weight method. The crew will be prepared to estimate the catch using this method well before the peak outmigration begins as there is no preparation time when catch numbers become large. It may not be necessary to use the catch-weight method on both traps simultaneously; it is desirable to count individual fish when possible. It is also mandatory to keep

an individual tally for each trap during catch-weight enumeration. The methods for the catch-weight estimation technique are

1. A sample of approximately 150 fish will be dipnetted from the trap(s) and weighed. This sample should be representative of the fish in the trap. This weight will be the reference weight for the next samples. The weight of the sample will be recorded in a field notebook.
2. The sample will be enumerated, by species, and any marked fish will be noted. These data will be recorded in a field notebook and the fish will then be released.
3. Subsequent samples will be taken from the trap(s). The weight of these samples will be measured and recorded, and the fish will be released.
4. A new reference weight will be taken every 10^{th} sample or earlier if size or species compositions obviously change.
5. These data will be transferred to the CATCH-WEIGHT WORKSHEET (Figure 5) when passage rates slow down.

Any data generated by this method will be clearly marked on the data sheets.

SMOLT AGE, WEIGHT, AND LENGTH SAMPLING (AWL)

Sockeye salmon smolt sampling at the lower trap will occur over the entire duration of the project. Sockeye salmon smolt sampling at the upper trap will be conducted for two consecutive nights following each mark-recapture test. If sufficient fish for a mark-recapture test are not available for an extended period of time (approximately more than ten days), the upper trap will fish two consecutive nights each during each statistical week, regardless of mark-recapture tests, in order to evaluate any possible size-specific bias in trap catches. Sampling statistical weeks and corresponding calendar dates are listed in Appendix A3.

A sample of 40 sockeye salmon smolt will be collected from the lower trap for five consecutive days per statistical week (200 fish per week) and sampled for AWL data over the course of the entire season. All smolt sampling data will reflect the smolt day in which the fish were captured, and samples will not be mixed between days.

Throughout each night, smolt will be netted out of the catch box and placed into an instream holding box. The number of fish collected hourly through the night will be proportional to the migration strength. It is important that the smolt sample represent the entire night's migration. These data are used to reconstruct the age class component of the emigration, and smolt of different sizes and ages may travel in separate schools throughout the night. At the end of the smolt day, 40 smolt will be randomly netted from the live box and sampled. All remaining smolt will be counted and released, unless they are being held for a future dye test. If less than 40 smolt are caught in a sampling night, all fish will be retained and the sample size for that day will be the number of fish caught. Dyed smolt used to estimate trap efficiency will not be selected as part of this sampling schedule.

Limited AWL samples will be collected from the upper trap during the season. This sampling will consist of 80 sockeye salmon smolt collected from the upper trap during the 2 days following a dye release (40 fish per night). This sampling regimen is intended to ensure ample fish are available for a mark-recapture experiments. If the outmigration is small enough that

sufficient numbers of fish are not available for a mark-recapture test, the upper trap will be fished two consecutive nights during each statistical sampling week. Each night, the trap will be fished until approximately 250 smolt are collected, then raised out of the water. From the 250 smolt, 40 fish will be retained in the live box for AWL sampling, and the remaining fish will be released immediately.

The standard procedures for collecting and recording salmon AWL data are defined in Appendix A. During the 2013 season, the data recording will be accomplished using a rugged digital assistant data logger (RDA). The field crew will be provided new equipment and sampling protocols as updates become available. Until that time, Appendix A will serve as the standard.

All scales will be collected from the preferred area of each fish (Appendix A4) following the methods described by International North Pacific Fish Commission (1963). Scales will be mounted on microscope slides (Appendix A5). Age determination will be made by project biologists in the office by examining scales for annual growth increments using a microfiche reader fitted with a 48X lens following designation criteria established by Mosher (1968).

The most common method of age determination in Pacific salmon is the analysis of the concentric rings (circuli) on the scale and is the method to be used by this study. Fast summer growth results in wide spacing between circuli, whereas slow winter growth results in closer spaced circuli; age is determined by enumerating the number of winters observed on the scale (Gilbert 1913). This method of age determination is ideal because the scale can be collected, processed, and aged quite rapidly.

Smolt will be sampled on the morning after capture. Smolt will be measured to the nearest mm from the tip of the snout to the tail fork (Appendix A4). Excess water will be removed from the smolt before weighing by using a paper towel as a blotter, and individual smolt weights measured to the nearest 0.1 g. A scalpel will be used to remove 5–10 scales from the preferred area of the fish (Appendix A4). The scales will be mounted on a glass microscope slide as shown in Appendix A5. Scales from a maximum of five fish will be mounted on each slide. The left portion of each slide will be labeled with slide number, sample location, species, date, and inclusive fish numbers that correspond to information entered in to the RDA (Appendix A5). After sampling, the fish will be moved to an aerated recovery bucket and held until all smolt are swimming normally. Both the recovery and pre-sampling holding buckets will be covered to minimize stress on the fish. Smolt will be released downstream of the trap and fyke net after all fish are swimming normally in the recovery bucket.

Common mistakes to avoid include

1. Poorly mounted scales – Too many scales in a smear, slime or debris present when mounting. The rows of scales should not be too close together to avoid confusing scales from two different smolt.
2. Improper numbering in the RDA – Take care to ensure numbers on the slides match the data and numbers put into the RDA. Look at the review screen on the RDA if it is believed a mistake has been made.
3. Scales removed from one fish contaminating the scale smear of the previous fish – Wipe the scalpel blade and dissecting probe off between each fish sampled.

MARK-RECAPTURE EXPERIMENTS

Trap efficiency estimates will be made every five days to estimate the number of sockeye salmon smolt emigrating from the Karluk River, or if the trap is moved. Bismarck Brown Y dye will be used to mark a sample of fish. The marked fish will be captured and released from the upper trap site. All smolt caught in the lower trap will be examined for marks, whether counting fish individually or if high catch volumes require the use of the catch-weight method. The proportion of recaptured fish will be used to estimate the proportion of the total emigration that is captured in the trap. The assumptions for mark-recapture experiments are

1. Mortality rates are equal between marked and unmarked fish,
2. All recaptured fish are recognized as such,
3. All marked fish do not lose their marks, and
4. Marked and unmarked fish have an equal chance of capture.

Every reasonable effort will be made to conform to these assumptions. The marking process can be very stressful for smolt, and care will be taken to avoid stressing the marked fish when possible. The primary causes of mortality are excessive handling, high water temperatures, low levels of dissolved oxygen, and exposure to the dye. The marked smolt will be released into the river across the width of the stream at the upper river trap site to ensure mixing with the unmarked population at a time when the migration for the evening is imminent.

The following methods will be used for marking and releasing smolt:

1. All data will be recorded on the SMOLT DYE RELEASE FORM (Figure 6).
2. Every five days, a sample of approximately 1,000 (including 200 for mark retention and delayed mortality studies) sockeye salmon smolt will be collected for marking. If run strength is not sufficient to capture all the smolt in one day, smolt will be held in an instream live box for up to three days. After the third evening, all smolt collected will be marked or released if the minimum sample size cannot be reached. Marked fish will not be sampled for AWL information.
3. A water pump will be used to fill two 24-gallon marking containers with river water. The fish will be transferred from the instream live box into the containers, which will then be covered. A water pump will be used to gently exchange the water in the containers. The smolt will be allowed to rest in the container for at least 30 minutes.
4. The circulation pumps will be turned off, and a solution of 4.6 g of Bismarck Brown Y dye will be mixed into each container. Three aerator units (or O_2 from bottle if equipped) will be placed in the marking containers and will operate continuously during the dyeing period. After 20 minutes in the dye, the pump will be restarted and the containers will be flushed with fresh water. The dye solution should be flushed after 20 minutes.
5. Following the dye treatment, the containers will be flushed with fresh water for a minimum of 90 minutes. Smolt displaying abnormal behavior will not be released.
6. At the upper trap site, the smolt will be evenly distributed across the stream by slowly pouring the smolt out of the 5-gallon buckets. The dye treatment and recovery process

will be timed so that the release takes place at approximately 2300 hours, and releases occur across the width of the river.

7. The lower trap will be monitored for recaptured marked fish beginning the day of release and continue through the next marking event. The number of marked fish will be observed and recorded on the DAILY SMOLT CATCH REPORTING FORM (Figure 3) and the SOCKEYE SALMON SMOLT REPORTING FORM (Figure 4). The number of smolt examined will equal the number of marked smolt plus the number of unmarked smolt caught each day. The daily smolt catch will not include marked smolt, since these fish have been previously counted when they were collected to be marked. Unmarked mortalities will be recorded as usual on the DAILY SMOLT CATCH REPORTING FORM. Any marked fish recovered in the trap dead will be noted in the comments section of the DAILY SMOLT CATCH REPORTING FORM.
8. In the event that it is necessary to use the catch-weight method to count smolt during a dye test period, the number of fish examined for marks will be the number of fish counted in the reference weight samples only. The total number of marked fish recovered will be extrapolated from the catch-weight method. Data generated from the catch-weight method will be clearly labeled.

Trapping conditions will be held constant between marking events. Modifications to the trap, including adjustments in lighting and trap location, will be made immediately before a marking event. If major changes in river flow rates or smolt migration patterns are noticed, a new marking event will follow as soon as possible. The Project Biologist will be consulted before any trap modifications are made unless immediate modifications are necessary to prevent loss of equipment or to prevent major smolt mortality. Any changes will be clearly documented in the daily log and in the comments section of the data forms. A tent erected onshore at the upper trap site will allow for storage of dye-test materials and provide some shelter for crew during the dye-tests. This tent will require strong tie-downs to resist winds common on the Karluk River.

MARK RETENTION/DELAYED MORTALITY EXPERIMENTS

A random subsample of 200 sockeye salmon smolt will be taken from the fish retained for marking for use in a combined mark retention and delayed mortality experiment. This experiment will be performed in conjunction with every dye test unless otherwise advised by the Project Biologist.

Before marking fish, 100 of the sockeye salmon smolt will be removed from the dye test container and placed in one side of a divided instream live box. After the marking and recovery period, an additional 100 marked smolt will be placed in the other side of the live box. These smolt will be examined daily for mortalities. The number of mortalities from each group will be recorded on the DELAYED MORTALITY / MARK-RETENTION FORM (Figure 7). These smolt will be released below the lower trap at the beginning of a new mark-recapture test or after five days, whichever is first. The daily smolt catch will not include these fish since they have already been counted.

Additionally, a sample of five marked and five unmarked smolt will be used to conduct daily identification trials. The purpose of this test is <u>not</u> to evaluate field personnel's identification ability, but to evaluate the mark-recapture assumptions. One crewmember will examine the smolt and the other will present the smolt. The duties will switch the next day. The examiner will not

look at the smolt before the trial. The presenter will, at random, select a smolt from the live box, present it in a dip net to the examiner for approximately one second, and immediately release the fish back to the appropriate side of the live box. The examiner will determine whether the smolt was marked or not; the presenter will record whether the examiner was correct. The presenter will not inform the examiner of the accuracy of his determinations until all 10 fish have been examined. It is desirable to mimic actual counting conditions as much as possible when conducting these trials; they will be performed under low light conditions. Results of this experiment will be recorded on the DELAYED MORTALITY / MARK-RETENTION FORM (Figure 7). When the experiment is finished, the smolt are counted and released below the lower trap, but not included in the daily smolt catch as they have been previously counted.

COLLECTION OF SMOLT SAMPLES FOR STABLE ISOTOPE ANALYSIS

Whole fish samples of sockeye salmon smolt will be collected from the lower trap for stable isotope analysis. Samples will be taken from early, midseason and late in the smolt migration. Fish will be collected based on both timing and estimated age-class. For the purpose of this study, fish caught in the trap prior to May 25 will be considered early migrating fish. Fish caught between May 26 and June 10 will be considered middle-migration, and fish caught June 11 or after will be considered later in the migration. Twenty large (~>135 mm; estimated age-3.), 20 medium (~134mm-120mm; estimated age-2.), and if present, 20 small (~<120mm; estimated age-1.) smolt will be collected from both the early and late migrations. Whole smolt samples will be kept as cold as possible and stored by size-class in zip-lock bags labeled with the date and either “small”, “medium” or “large”. If age-1. fish are present throughout the season, there would be a total of 180 fish collected for stable isotope analysis. It is best to collect samples when it is known that a chartered plane will be arriving in the near future, as the whole fish samples need to be frozen as soon as possible.

PHYSICAL DATA

Air and water temperature, cloud cover, wind direction and velocity, and relative stream height will be measured twice daily (NOON and MIDNIGHT) throughout the season. This information will be recorded on the DAILY PHYSICAL DATA OBSERVATION FORM (Figure 8).

WEATHERPORT CONSTRUCTION

A portable building will be erected onshore at the lower trap each year. Instructions are located in Appendix E. At the end of each season, the portable building will be dismantled and the canvas shipped back to town for winter storage. The metal supports will be stored underneath the platform to prevent bears from damaging the supports. Additionally, the platform will be treated with weather-resistant stain, and an electric fence left standing around the platform to protect against bear activity.

OTHER REQUIREMENTS

SAFETY

Prior to field deployment each crewmember will be certified in CPR and First Aid, and have read the following sections of the ADF&G SOP guidelines.

- Safety Policy Standards
- Field Camp Safety
- Aircraft Passenger Safety
- Small Tool Handling
- Firearm and Bear Safety

The ADF&G safety policies will be reviewed and followed by each field crewmember at the beginning of the season and referenced throughout the field season.

In the event of a life-threatening emergency, contact will be made directly to USCG emergency rescue at **1-800-478-5555** or VHF Channel 16. Additionally, a call to the Brown Bear Research Center located on Camp Island at 907-433-7900 or 907-433-7901 or VHF Channel 18 will be made immediately. The Karluk Lake outlet is located at

57.44093° N lat and 154.10942° W long.

The Karluk Lake sockeye salmon smolt study is in bear country, and trash produced from this camp will be handled in a responsible manner. All organic matter will be disposed of in the lake. All inorganic materials will be doubled-bagged with trash bags and shipped to town via the next available chartered plane.

A handheld VHF radio will be kept at the weatherport, and communication between the cabin and weatherport will be maintained to ensure safety when crew members are working alone. Bearspray and a firearm will be provided to crew, and crew will be familiar with appropriate bear safety behavior.

RESUPPLY

Resupply items (e.g., groceries, fuel, mail, etc.) will be sent via chartered float plane. All air charter flights will be set up by office staff. Appropriate information in regard to fight logistics and times will be relayed via satellite phone communications. When planning for the resupply flights it will be import to prepare back haul items and maximize the use of the chartered aircraft. Items to send back to town will include empty fuel containers, trash, biological data, and whole fish samples.

REPORTING

The crew leader will compile a daily log of activities and events, including personnel issues or problems with the project setup. This log will be submitted to the Project Biologist at the end of the field season, and should be a detailed account of daily activities undertaken by themselves as well as the crew. Additionally, daily activities and any unusual events will be recorded by the crew and/or crew leader in the crew notes logbook. The crew leader will contact the project biologist daily at 1300 hours by telephone (486-1835) unless otherwise needed or predetermined.

The crew leader will verify that daily smolt emigration counts, water level, and water temperature has been recorded every morning accurately by 12:00. The crew leader is also responsible for compiling a weekly field report, co-authoring a season summary, and for completing a comprehensive equipment inventory at the end of the season.

It is desirable for the field crews to photograph all aspects of the fieldwork. Photographs will be taken with a digital camera and downloaded on to the research field computer for editing and storage.

TIMESHEETS

The crew leader is responsible for scheduling daily tasks. Tasks will be scheduled to minimize overtime. Overtime is limited to 30 hours/month (7.5 hours/week) per person, unless otherwise pre-authorized. A proposed work schedule is described in Appendix C1. The crew leader will document, as part of the daily log, all tasks that are performed and the actual hours worked to complete those tasks.

Timesheets will be completed and mailed to Kodiak before the 15th and the last day of each month as possible with resupply flight timing. If timesheets must be sent in early, amended timesheets can be sent to the Kodiak office if the hours actually worked differ from the hours submitted on the original timesheet. Explicit directions for completing timesheets are located in Appendix D1 and D2.

RESPECT FOR HISTORIC SITES IN KARLUK AREA

The native Alutiiq people of Kodiak have lived in the Karluk Area for thousands of years, and as a result, there are many archeologically-important sites in the area of the smolt project. Housepits, fish weirs, and artifacts including human remains have been recorded in the direct vicinity of the smolt project. Utmost care should be taken to ensure minimal disturbance to archeological sites, and respect should be maintained for the historical, cultural, and archeological importance of the area. In the event that artifacts are discovered while working at the smolt enumeration project, they will be left undisturbed at the site where found, and reported to the Project biologist, who will contact the appropriate archeological personnel. Further information on the history of the native Alutiiq people can be provided to project personnel who express an interest in learning more about the area.

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FIGURES

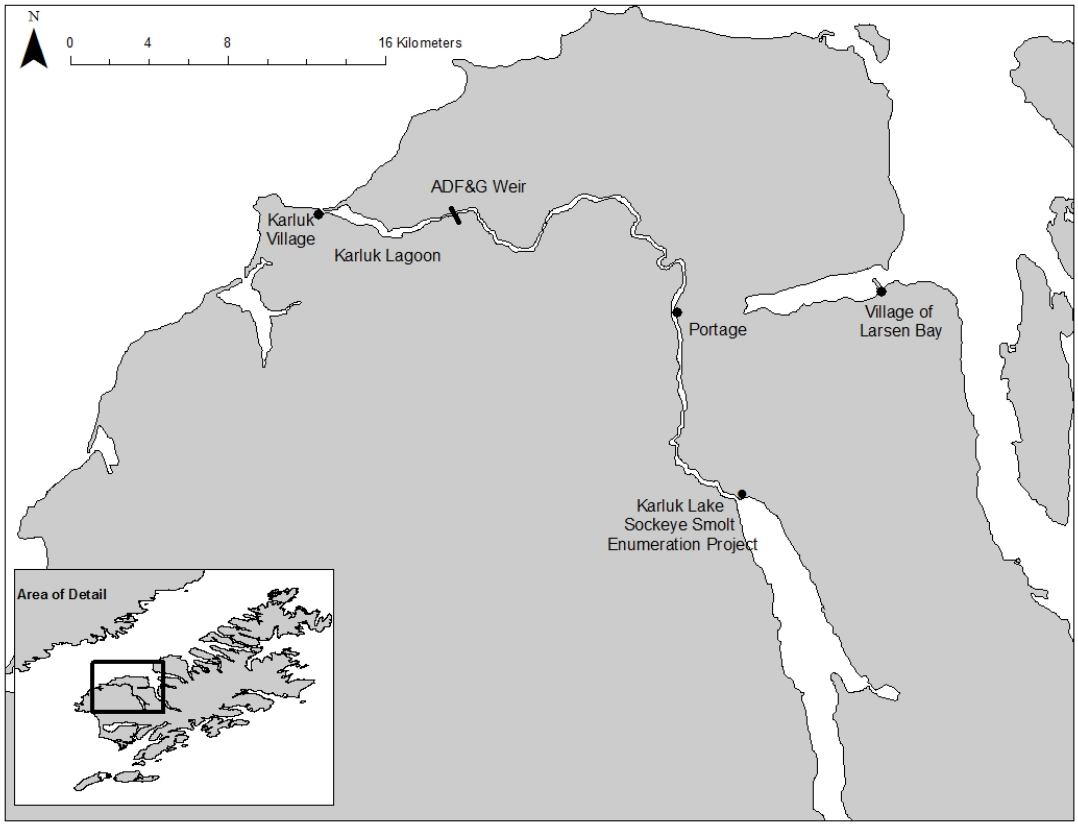


Figure 1.–Location of the Karluk Lake outlet, Karluk River weir, the village of Karluk, and the neighboring village of Larsen Bay.

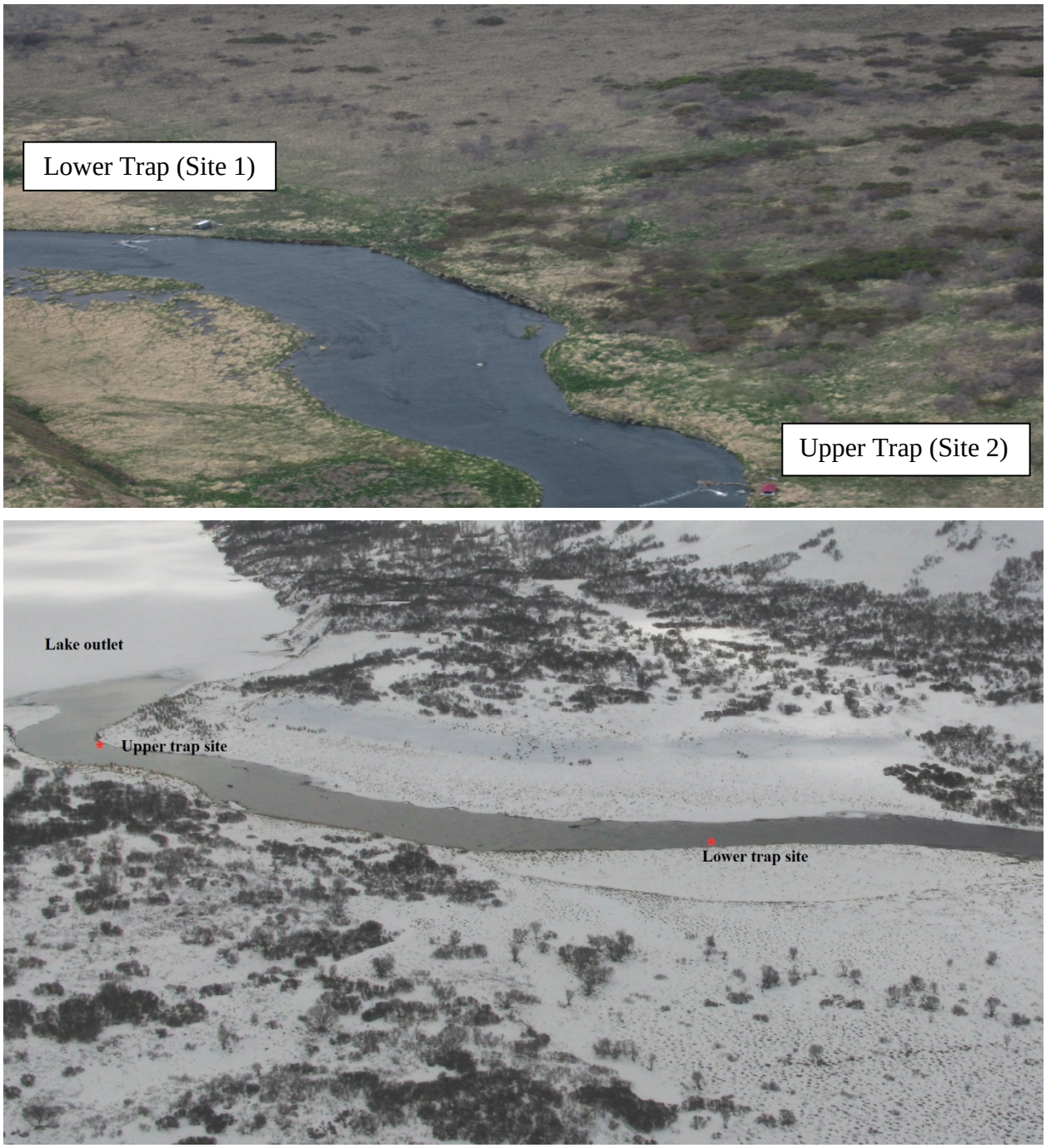


Figure 2.–Approximate Canadian fan trap locations on the Karluk River.

Daily Smolt Catch Reporting Form

Trap: _____

Project:_____ Smolt date: _____ Page ____of ____

Time (military)	Sockeye counts					Other counts					Comments[3]
	Catch[1]	Examined for Marks[2]	Marked Recoveries	Trap Mortality	Sockeye Fry	Coho	Dolly V.	Stickleback	Smelt	Sculpin	
Daily Total:											

[1] Catch includes all trap mortalities, but not marked fish.

[2] This number should equal the catch column unless the catch weight method is used or some other circumstance prevents the examination of all captured smolt.

[3] Include weather changes, water level changes, counts of species not included in columns, and any other significant information.

Figure 3.–Daily smolt catch reporting form.

Sockeye Salmon Smolt Reporting Form

Project:_____ Year:_____ Page ____of ____

Smolt Date	Catch			AWL Sample		Mark-Recapture[2]				Comments
	Daily	Cumulative	Mortalities[1]	Daily	Cumulative	# Released	Daily Recaptures	Cumulative Recaptures	%[3]	

[1] Included in daily count.

[2] Cumulative and % begin over with each release.

[3] Calculated by: % = (cumulative recaptured / #released) * 100

Figure 4.–Sockeye salmon smolt reporting form.

Catch-Weight Worksheet

Smolt Date_____ Page____of ____

Time	Weight	Number of Fish[a]					
		Sockeye	Sockeye Fry	DV	Stick	Coho	Sockeye Recaps[b]
	Total:						

[a] Number of fish in reference sample is from actual counts. Number of fish in subsequent samples is calculated by: $S_c = (S_r * W_s) / W_r$

Where: S_c = Calculated number of fish of each species.

S_r = Number of fish of each species in the reference sample.

W_s = Weight of subsequent sample.

W_r = Weight of reference sample.

[b] Recapture numbers are <u>not</u> included in the number of sockeye column.

Figure 5.–Catch-weight worksheet.

Smolt Dye Release Form

Smolt Day:_____

Grams Dye:_____
Tote Volume:_____

	Time (military)	H_2O Temp.	Comments
Fish into Container			
Begin recovery water exchange			
Addition of dye			
Begin water exchange			
Begin transport			
Release			

Number released:_____

Number held for mark retention experiments:_____

Number of mortalities:_____

Comments (include comments on fish vigor, areas of mortality, how well marked the fish were, etc.):

Personnel:

Figure 6.–Smolt dye release form.

Delayed Mortality/Mark-Retention Form

Date/time fish were marked:_____ Grams dye:_____

Water temp. when fish were marked:_____ Water volume:_____

No. marked fish retained:_____ No. unmarked fish retained:_____

Delayed Mortality

Date	Time	H_2O Temp.	# of mortalities	
			Marked	Unmarked

Mark-Retention

Date	Time	Observer	# Correctly Identified	
			Marked	Unmarked
			5	5
			5	5
			5	5
			5	5
			5	5
			5	5
			5	5

Comments:

Figure 7.–Delayed mortality/mark retention form.

Daily Physical Observation Form

PROJECT ______________

YEAR ________ Location ______________

		TEMPERATURE (C)		CLOUD	WIND		GAUGE	COMMENTS (i.e., rain, drizzle, etc...)
DATE	TIME	Air	Water	COVER (%)	DIRECTION	VEL (kts)	HEIGHT (cm)	

Figure 8.–Daily physical observation form.

APPENDIX A. SMOLT SAMPLING

Appendix A1.–Statistical (sampling) weeks and associated calendar dates.

Week	Calendar Dates	Week	Calendar Dates
10	1-Mar – 7-Mar	28	5-Jul – 11-Jul
11	8-Mar – 14-Mar	29	12-Jul – 18-Jul
12	15-Mar – 21-Mar	30	19-Jul – 25-Jul
13	22-Mar – 28-Mar	31	26-Jul – 1-Aug
14	29-Mar – 4-Apr	32	2-Aug – 8-Aug
15	5-Apr – 11-Apr	33	9-Aug – 15-Aug
16	12-Apr – 18-Apr	34	16-Aug – 22-Aug
17	19-Apr – 25-Apr	35	23-Aug – 29-Aug
18	26-Apr – 2-May	36	30-Aug – 5-Sep
19	3-May – 9-May	37	6-Sep – 12-Sep
20	10-May – 16-May	38	13-Sep – 19-Sep
21	17-May – 23-May	39	20-Sep – 26-Sep
22	24-May – 30-May	40	27-Sep – 3-Oct
23	31-May – 6-Jun	41	4-Oct – 10-Oct
24	7-Jun – 13-Jun	42	11-Oct – 17-Oct
25	14-Jun – 20-Jun	43	18-Oct – 24-Oct
26	21-Jun – 27-Jun	44	25-Oct – 31-Oct
27	28-Jun – 4-Jul	45	1-Nov – 7-Nov

SAMPLING PROCEDURES

LABEL SLIDES

The left portion of each slide should be labeled prior to sampling using a fine point permanent marker with the slide number, species, area sampled, date, and fish numbers of the sample (Figure 1).

Slide number

Write the number of the slide.

Species

Write out completely (e.g., Sockeye).

Area sampled

Write the area where the fish were collected.

Sampling date

The sampling day is the 24-hour period from noon of the first day to noon the following day, and is identified by the calendar date corresponding to noon on the first day.

Fish numbers

Fish should be sequentially numbered, beginning with 1 each sampling event. By starting with 1 each sampling event, it is possible to track how many fish have been sampled. Five fish are placed on each slide.

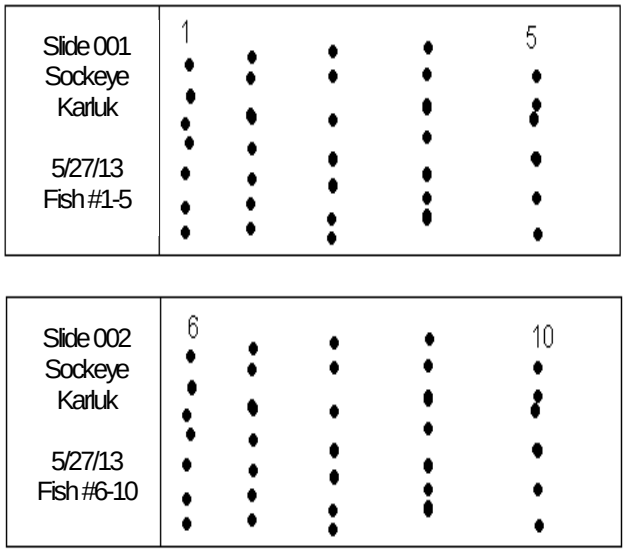


Figure 1.–Properly labeled smolt slide.

-continued-

SAMPLE ASAP

Sample smolt as soon as possible after they are captured.

MIX ANESTHETIZING SOLUTION

Wearing latex gloves to prevent direct exposure to the anesthetic, dissolve a small amount (approximately of 1 g) of Tricane Methanesulfate (MS-222) and baking soda in about 2 L of cold water in a dish pan. The amount of anesthetic needed will vary depending on the water temperature, freshness of the chemical, and size of the smolt.

SET UP RECOVERY BUCKET

Set up an additional bucket of water to be used as a recovery bucket. This bucket should be filled with fresh water, aerated, and covered to avoid stress on the fish.

TRANSPORT SMOLT TO SAMPLING AREA

Transport smolt, using clean 5-gallon buckets, to the sampling area. Buckets containing smolt should be filled with fresh water, aerated, and covered to avoid stress on the fish. Fish can be placed into the bucket using a dip net, or by dipping the bucket into the live box.

ANESTHETIZE SMOLT A FEW AT A TIME

Place a few smolt in the anesthetic solution until they become subdued to a point where they can no longer flex their axial musculature but can still ventilate their gills. The concentration of the solution should be such that it immobilizes the fish in 2–3 minutes.

LIGHTLY DRY PREFERRED AREA

After the fish are anesthetized, carefully remove a fish from the dish pan and gently pat dry with a paper towel.

SAMPLE SMOLT

Place the fish on its right side to sample the left side. Quickly and carefully take length and weight measurements, and remove 5–10 scales from the preferred area of the smolt using a scalpel (Figure 2). On salmon species, the preferred scale is located where a straight line between the posterior insertion of the dorsal fin and the anterior insertion of the anal fin crosses the second scale row dorsal to the lateral line. If scales are not present in this area then scales should be taken from the secondary location, which is the same area on the right side of the fish.

-continued-

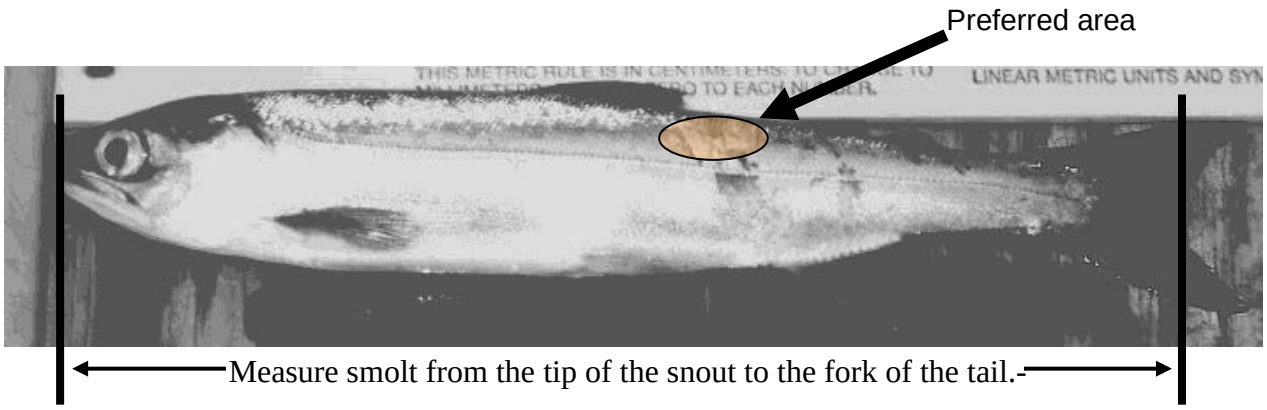


Figure 2.–Smolt with proper length measurement and preferred area highlighted.

MOVE SMOLT TO RECOVERY BUCKET

Transfer sampled smolt from the sampling station to the recovery bucket. It is important to sample as quickly as possible and immediately place smolt into the recovery bucket to prevent mortality.

ALIGN SCALES ON SLIDE

Using the dissecting probe, line up and spread out the scales on the slide under the correct fish number (Figure 1).

CLEAN SAMPLING SUPPLIES

Wipe off the scalpel and dissecting probe to remove scales and slime before another smolt is sampled.

CONTINUE SAMPLING

Continue sampling smolt until sampling goals are met, or all available smolt have been sampled. Depending on how long it takes to complete the sample, the water in all buckets (holding, recovery, and anesthetizing) may need to be refreshed.

RELESASE SMOLT

Once the sampled fish have recovered and are swimming normally in the recovery bucket, they should be released downstream of the trapping location.

-continued-

DATA ENTRY/MANAGEMENT

Data obtained while sampling, is recorded using a Meazura Rugged Digital Assistant (RDA). The RDA is a waterproof device used to digitally record sampling data. Sample information is transferred from the device to a netbook after each sample. A USB flash drive is used to save and transfer data from the netbooks located in field camps, to the office, throughout the season. An RDA is shown in Figure 3.

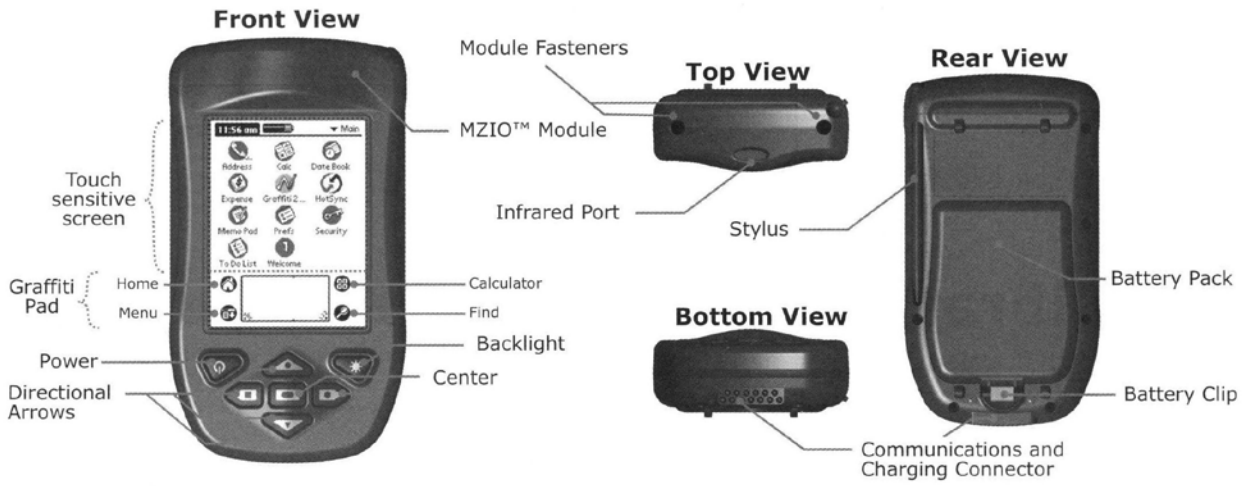


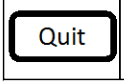
Figure 3.–Rugged Digital Assistant (RDA).

ENTERING DATA INTO THE RDA

To begin using the RDA, turn it on by pressing the power button (Table 1). Using the stylus, tap the home icon in the bottom portion of the screen to bring up the main menu. It may be necessary to press the home icon several times to bring up the entire main menu. Next, tap the Forms 5.1 icon. Pendragon Froms (Forms 5.1) is the program that you will use to enter all of the sample data. After the icon is selected, the Pendragon Forms screen will appear. If a form was left open by a previous user, it may be necessary to hit the Quit or Done button to get to the main list of forms. Highlight the appropriate sampling form (Smolt_2013.XX) and select New, which is found in the lower left corner of the screen. The four main buttons of the form will now be visible: Enter Background Info, Sample Next Fish, Review, and Quit.

-continued-

Table 1.–Buttons and icons addressed in the text.

Image	Description
	Power Button - Button you will press on the RDA itself
	Home Icon - Use the stylus to navigate to the home screens
	Forms 5.1 Icon - Use the stylus to open pendragon forms 5.1
	This is an example of a button within pendragon forms. Use the stylus to select these buttons.

ENTER BACKGROUND INFO

Background information must be entered at the start of each sampling event. A new day always constitutes a new sampling event, so it will be necessary to enter new background information typically once per sampling day. It is important to edit background information when any change in sampling information occurs. The following topics constitute sampling information. If information in one of the following categories changes, it is necessary to change the background information.

Species

Select the appropriate species from the drop down list on the RDA.

Management Area

Choose the relevant management area from the dropdown list. Samples collected from Kodiak Island statistical areas must have Kodiak selected as the proper management area.

Area Sampled

Select the area that best represents where the fish were sampled, such as Ayakulik River, from the dropdown list.

Location ID (N/A for some areas)

Enter the site where the fish being sampled are from. For Karluk Lake sockeye salmon smolt sampling, Site 1 is the outlet site and Site 2 is further downstream.

Location Type

Indicate the type of area in which the fish were captured.

-continued-

Gear Type

Select the type of gear in which the smolt were caught.

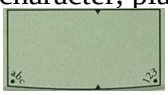
Date of Sample

For smolt, the sampling day is the 24-hour period from noon of the first day to noon the following day, and is identified by the calendar date corresponding to noon on the first day.

Sampler Initials

Enter the initials of the sampling crew (up to 3 persons). This can be done by writing in the box on the bottom of the screen, or by using the pop up keyboard.

Notes

1. When entering text, tap on the dot by the abc icon to bring up a keyboard. 
2. To delete a character, place the stylus in the text box and draw a small straight line from right to left. 

SAMPLE NEXT FISH:

After entering background information, the RDA is ready to collect individual fish data. The Sample Next Fish button is used to enter the details of each fish sampled. It is not necessary to click on the Sample Next Fish button when entering the first fish of a new sample. After entering the background information, the form automatically knows to go to the sample next fish section of the form. As you continue to sample, simply tap Sample Next Fish or Next to enter individual fish data. This option is used when continuing to the next fish of a sample where no background information has changed. Fish data that is entered here is associated with the current background information logged. The following constitute fish data and should be entered for each fish.

Scale Slide (Card) Number

Slides are numbered sequentially by date throughout the season starting with 1. A separate numbering sequence will be used for each species or major location change. Consult your crew leader for the current slide number. It is crucial to make sure the number written on the slide matches the slide (card) number entered into the RDA. The slide number will automatically advance to next number after five fish have been sampled.

Fish Number

The fish number is a sequential numbering system that begins with the number 1 for each sampling event. This allows samplers to keep track of the number of fish sampled each day (or since the background was changed). By default, the fish number in the RDA will automatically advance after each fish is sampled.

-continued-

Length in mm

Enter the length of the smolt from tip of snout to tail fork in millimeters (i.e., 108). If for some reason you do not collect a length measurement, enter 999.

Fin Clip and Genetics

Select the Skip Fin Clip and Genetics button if appropriate. If sampling involves fin clips or genetics you can enter the optional fin clip and genetics information.

Sample Next Fish

Select Sample Next Fish to continue sampling.

REVIEW/EDIT

The review button can be a very useful tool during sampling. It can be used to ensure data being entered is accurate, or it can be used for editing fish data during a sample. The review portion of the form displays slide number, fish number, length, and weight. The most recently sampled fish appear first. To enter the review screen, tap on the Review button on the main screen of the form. After the data has been reviewed and edited, tap the Done button on the bottom right of the screen to return to the main screen of the form. If Sample Next Fish is selected after leaving the review screen, the auto-increment will continue as if the review screen was never entered.

Reviewing Data

To review the last data entered, tap the Review button on the main screen of the form. Use the scroll bar on the right side of the screen to look at the fish that have been entered.

Editing Data

If fish data needs to be edited, tap on it using the stylus. Tap on the Sample Next Fish button to go through the fish data that was previously entered for that fish. Changes can be made as needed. Buttons chosen prior to the review are highlighted with asterisks. After a fish has been edited, the main review screen appears. If a fish is accidently selected from the main review screen, click the button that has the slide#-fish# to return to the main review screen without going through the fish data. As mentioned above, tap Done to exit the review portion of the form and return to the main screen.

QUIT

When sampling is complete, tap Quit to exit the form.

-continued-

DATA MANAGEMENT

After sampling is done for the day, the data must be backed up on the RDA itself and then transferred (by HotSync) to the netbook.

BACKING UP DATA

After each sample the RDA should be backed up so that data is stored on both of the compact flash drives. Turn the RDA on, and tap the home icon in the bottom portion of the screen to bring up the main menu. Tap the CardBkup icon if it is present, and then the Backup Now button at the top left of the screen. The data will now be on both flash drives. If the RDA does not have a CardBkup icon, it will back up automatically.

DOWNLOADING DATA TO NETBOOK

Connect the communications cable into the RDA and a USB port on the netbook. Press the power button to turn on the RDA and begin a HotSync by tapping the home icon, and then the HotSync icon found on the main menu. Tapping the large icon in the center of the screen will start the HotSync operation (Figure 4). Please make sure the RDA is dry before downloading any data to the netbook.

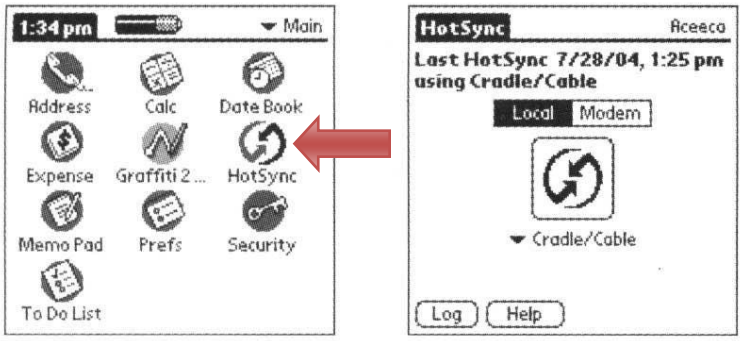


Figure 4.–HotSync Screens Found on RDA.

-continued-

EDITING, NAMING, AND SAVING DATA

If a mistake is realized during a sample it is often easiest to document the mistake and send the correction in with the USB flash drive for the Kodiak office to fix. If a mistake is made during the sample it can be changed using the review portion of the form in the RDA. Data can also be changed after it is downloaded onto the netbook, but is not recommended unless the Kodiak office is consulted first. A HotSync operation after changes have been made on the netbook will update the RDA.

-continued-

To view data, HotSync the RDA and open Pendragon Forms Manager (a shortcut should be located to the right of the start menu) on the netbook. Select the form (Smolt_2013.XX), and click Edit/View under Data Functions on the right side of the window. All data will now be visible. Simply make the necessary minor changes here and exit out of the window to save. It is important to change the correct the numbers under the proper column which is where it is best to consult the Kodiak office. Hotsync the RDA to the netbook after any changes are made on the netbook to update the RDA with all changes.

After data has been edited and verified, a copy of the database will need to be exported from the Pendragon software and saved on the netbook. In Pendragon Forms Manager under Data Functions on the right side of the window, click To ASCII. Navigate to the folder in which the data is being saved. Type in the file name and then save. The file name should follow this format: Area_Sampled_Smolt_YYYYMMDD.csv (e.g., Afognak_River_Smolt20130614.csv). After saving, a window will pop up stating the file has been created. Each .csv file will contain all of the data that has been collected up to that point in the season. Do not edit or save the .csv file as an excel file or it will be difficult or impossible to upload the data into the database.

TRANSFERRING DATA FROM NETBOOK ONTO USB FLASH DRIVE

Up to date data should be sent into the main office as often as possible (e.g., with the grocery plane). Insert a USB flash drive into an appropriate port on the netbook. Double click on MyComputer, which is found on the desktop of the netbook. Navigate to the folder where your data is saved and highlight the most recent file (determined by the date) by single clicking. With the file highlighted, click on edit at the top of the window and then copy. Open up MyComputer and double click on the USB flash drive (often called “Removable Disk”) found under the heading “Devices with Removable Storage.” Click on edit at the top of the window, and then paste. The .csv file that was copied earlier will appear in the window indicating it was copied to the flash drive. Exit out of all windows and single click on the safely remove hardware button on the bottom right corner of the desktop in the quick start menu. Click on “Safely remove USB Mass Storage Device.” A pop-up will verify that it is now safe to remove the flash drive from the system.

POWERING THE NETBOOK AND RDA

1. The RDA can be charged with either the AC or DC powering options. It is the crew leaders responsibility to keep it charged
2. The netbook can only be charged with the AC power adaptor, therefore plan accordingly for generator use. The charging light on the netbook is red when charging, and green when fully charged.
3. If there are powering problems, please contact the office immediately.

-continued-

SOME NOTES AND REMINDERS

1. Connect the AC adaptor to the bottom of the communications cable to charge the RDA batteries. If using the DC charger, connect the charger into the communications port.
2. If a mistake is noticed before moving onto the next fish, the previous button can be used to make changes in the RDA without having to go to the review screen or alter the data on the netbook.
3. Each length, weight, and scale must correspond to a single fish! It is the responsibility of the crew leader to be sure the data has been entered correctly.
4. Never put data from different dates onto one slide, and always enter new background information. Even if only one fish is sampled that day, enter new background information and begin with a new slide the next day.
5. Responsibility for accuracy lies first with the primary data collector(s) and finally with the crew leader. Sloppy or incomplete data or slides will be returned to individual collectors for correction.
6. Ensure that all equipment is well kept. Electronics should be stored in a clean safe place. The RDA must be completely dry before transferring data to the netbook. RDA batteries must be charged to make certain sampling is not hampered. It is the responsibility of the crew leader to make sure that all data is carefully examined and before returning it to their supervisor.

TROUBLESHOOTING

RESETTING THE RDA

If problems are encountered with the RDA, a soft reset can be done without losing data. To perform a soft reset hold the power and backlight button down together, and release at the same time. If a soft reset does not work, the office should be contacted about other options for resetting.


Press and release Power and Backlight button together

HOTSYNC ERROR MESSAGE

HotSync message "Exceeded user storage space limit of 500KB in form 'Smolt_2013.XX'

1. Open Pendragon Forms Manager
2. Under Form Function click on "Properties"
3. Click on "Advanced Properties"
4. Click on the "Synchronization Tab"
5. Change the Storage Limit (KB) to 5000 instead of 500.
6. Click "OK"
7. Under Form Functions Click on "Distribute"

APPENDIX B. JUVENILE SALMON IDENTIFICATION

Key to Field Identification of Anadromous Juvenile Salmonids in the Pacific Northwest

By

ROBERT J. McCONNELL and GEORGE R. SNYDER

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Northwest Fisheries Center
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ABSTRACT

A key is presented with descriptive illustrations to help in field identification of live, juvenile salmonids in fresh waters of the Pacific Northwest. Other juvenile fish that may be mistakenly identified as salmonids are included.

INTRODUCTION

Species identification of live, anadromous juvenile salmonids is frequently a problem to the field biologist. The purpose of this key is to list and illustrate the external characteristics which will expedite field identification of juvenile salmonids in the Pacific Northwest.

Five species of Pacific salmon (pink, chum, sockeye, chinook, and coho); four species of trout (cutthroat, brown, Dolly Varden, and rainbow or steelhead); and other juvenile and adult fish [1] that may be mistaken for salmon or trout in fresh water are described in this key.

USE OF KEY

The characteristics for identification are listed in a series of alternative statements, some of which are illustrated. To use the key, examine the first statement; if applicable, proceed to the next and continue to successive statements until the species is identified. If a statement is not applicable, pass to the alternative characteristics indicated by numbers in parentheses (numbers on the drawings correspond to numbers of statements in the key). Continue in this manner until the specimen is identified. Some external characteristics are positive separating features (marked with asterisk), whereas others are not. Therefore, two or more statements should be considered before final rejection. If a precise identification cannot be made using the external characteristics —and the fish can be sacrificed, a positive identification can usually be made from internal features (marked with double asterisks). A bibliography of keys that utilize more descriptive internal characteristics is included in this paper.

[1] Especially adult smelt, family Osmeridae.

KEY

1. (47) Adipose fin and scales present. (Fig. 1)
2. (48) Fleshy appendage at base of pelvic fins present.
3. (49) Mouth large, reaching at least to center of eye.

Family Salmonidae

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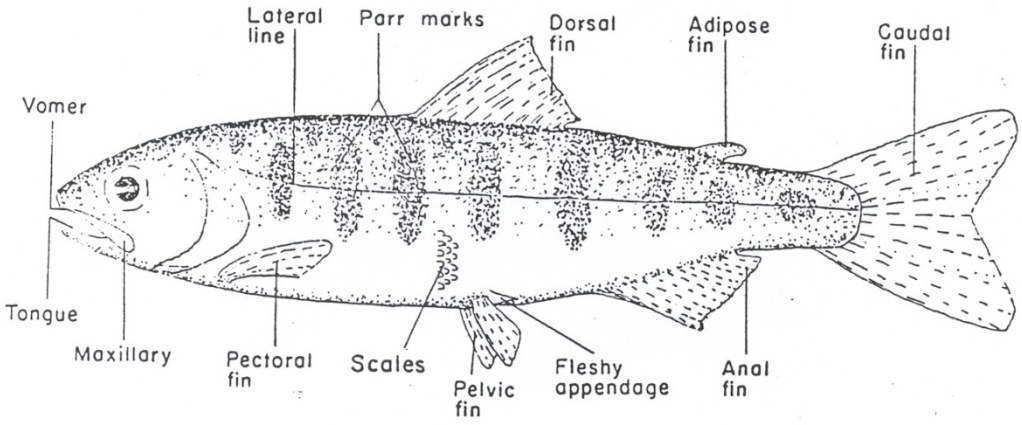

Figure 1.—A hypothetical salmonid showing external characteristics.

4. (17) Anal fin higher than long, with 8 to 12 developed rays (Fig. 2A)
5. (52) *Teeth on head and shaft of vomer. (Fig. 3A)

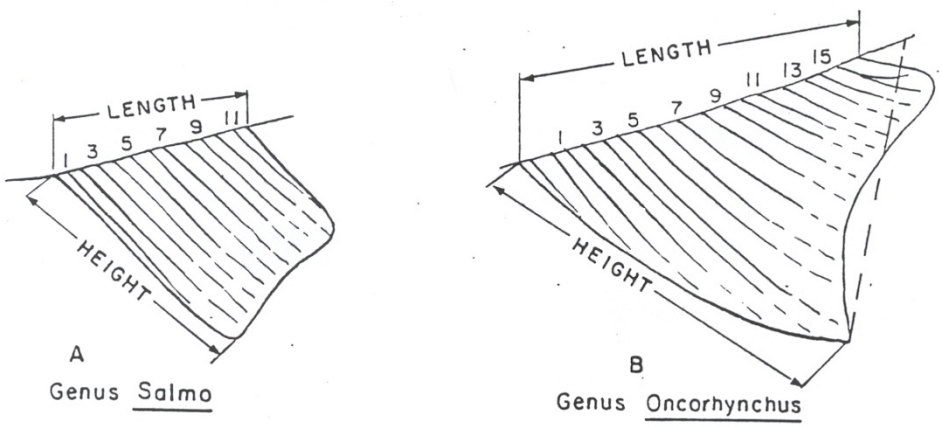

Figure 2.—Anal fins: (A) Trout, genus *Salmo;* (B) Pacific salmon, genus *Oncorhynchus.* The two drawings show differences in structure and fin ray count. (Note that the length of the anal fin is its overall basal length, and its height is that distance from the origin of the fin to the tip of the anterior lobe. In counting fin rays, include only those which originate from the base and terminate at the outer margin of the fin or are half as long as [or greater than] the longest ray.)

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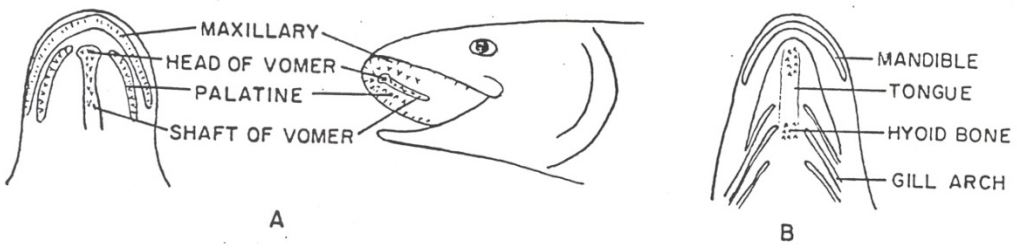
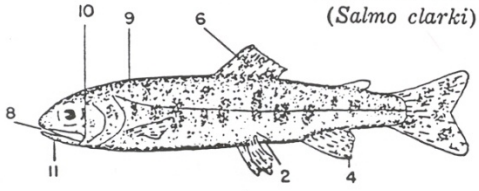


Figure 3.—Location of dentition in (A) the roof and (B) the floor of the mouth of salmonid fishes. (Presence or absence of teeth on the vomer or tongue may be determined by use of the little finger or a blunt instrument. The small hyoid teeth at the base of the tongue are located between the gill arches of the lower jaw and are difficult to find.)

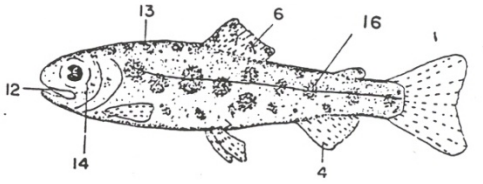
6. (18) Dorsal fin with large dark spots.
Trout
Genus *Salmo*

7. (53) Adipose fin not orange; no row of pale round spots along lateral line.
8. (12) *Small hyoid teeth at base of tongue. (Fig. 3B)
9. (13) Not more than five parr marks on mid-dorsal ahead of dorsal fin.
10. (14) Maxillary reaching past posterior margin of eye.
11. (15) Red or yellowish hyoid mark under lower jaw. Tail usually black spotted.
Cutthroat trout
(*Salmo clarki*)



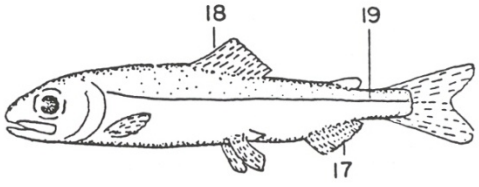
12. (8) *No teeth at base of tongue.
13. (9) Five to 10 parr marks along mid-dorsal ridge ahead of dorsal fin.
14. (10) Maxillary short, not reaching past posterior margin of eye.
15. (11) No hyoid mark under lower jaw. Few or no spots on tail.

16. (20) Parr marks almost round.
Rainbow or steelhead trout
(*Salmo gairdneri*)



17. (4) Anal fin longer than high, with 13 or more developed rays. (Fig. 2B)
18. (6) Dorsal fin without large dark spots, may be black tipped.
Pacific salmon
Genus *Oncorhynchus*

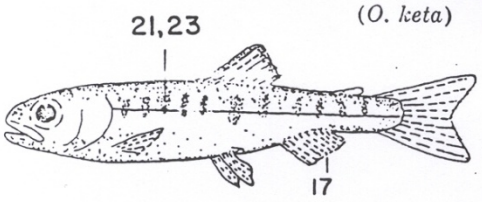
19. (20) No parr marks. Fry leave fresh water while small—approximately 1.75 inches (45 mm) long.
Pink salmon
(*O. gorbuscha*)



-continued-

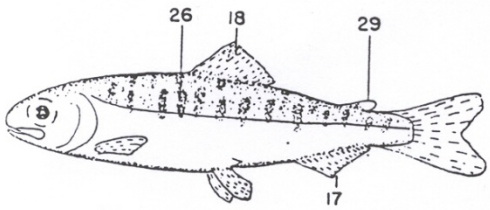
20. (16) Parr marks present as vertical bars or oval spots.
21. (30) Parr marks short, extending little, if any, below lateral line.
22. (25) Gill rakers on first arch, 19 to 26. ** Pyloric caeca, 140 to 186.
23. (26) Parr marks faint. Sides below lateral line iridescent green.
24. (27) Small when migrating from fresh water, approximately 1.5 inches (40 mm) long.

Chum salmon
(*O. keta*)



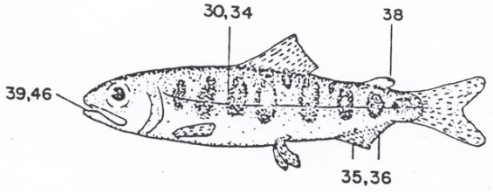
25. (22) Gill rakers on first arch, 30 to 40. **Pyloric caeca 60 to 115.
26. (23) Parr marks usually sharply defined. Sides below lateral line silvery, not iridescent green.
27. (24) Relatively large when migrating from fresh water, approximately 3 to 5 inches (80 to 126 mm) long.
28. (31) Gill rakers long and slender, more than 29 on first arch.
29. (32) Adipose fin clear, not pigmented.

Sockeye salmon
(*O. nerka*)



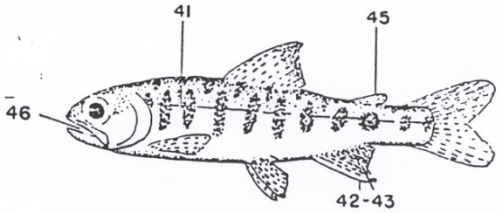
30. (21) Parr marks large, vertical bars centered by lateral line.
31. (28) **Gill rakers short and thick, fewer than 29 on first arch.
32. (29) Adipose fin at least partially pigmented.
33. (40) **Plyloric caeca more than 90.
34. (41) Parr marks broader than interspaces.
35. (42) Anterior rays of anal fin not distinctly longer than rest, not white edged.
36. (43) Anal fin not pigmented.
37. (44) Black spots, when present, on both lobes of caudal fin.
38. (45) Adipose fin not completely mottled, clear area at anterior base of fin.
39. (46) Black gums along base of lower teeth.

Chinook salmon
(*O. tshawytscha*)



40. (33) **Plyloric caeca less than 80.
41. (34) Parr marks narrower than interspaces.
42. (35) Anterior rays of anal fin elongated; when depressed they extend to base of last ray. (Fig. 2B)
43. (36) Anal fin pigmented between rays, resulting in black banding.
44. (37) Black spots, when present, on upper lobe of caudal.
45. (38) Adipose fin completely pigmented.
46. (36) Mouth gray to white.

Coho salmon
(*O. kisutch*)



-continued-

47. (1) Adipose fin not present; scales present or lacking.

Not Salmonidae

48. (2) No fleshy appendage at base of pelvic fins.

Smelts
Family Osmeridae

49. (3) Mouth small, not reaching center of eye; teeth weak or absent.

50. (51) Depressed dorsal fin, shorter than head.

Whitefishes
Genus *Coregonus*

51. (50) Depressed dorsal fin, longer than head.

Arctic grayling
(*Thymallus arcticus*)

52. (5) **Teeth on head of vomer only.

Chars
Genus *Salvelinus*
Dolly Varden (*S. malma*)

53. (7) Adipose fin orange; row of distinct pale round spots along lateral line.

Brown trout
(*Salmo trutta*)

ACKNOWLEDGMENTS

We especially thank Dr. Arthur D. Welander, Professor of Fisheries, and Dr. Bruce S. Miller, Research Biologist, College of Fisheries, University of Washington, Seattle, for their valuable suggestions. We also thank Galen H. Maxfield, Fishery Biologist, and Dr. Alan J. Beardsley, Fishery Biologist, both from the NMFS Northwest Fisheries Center, Seattle.

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Appendix B2.–Photos of fishes common in the Karluk watershed.

Figure 1. Juvenile Sockeye salmon.

Figure 2. Juvenile coho salmon.

-continued-

Figure 3. Stickleback.

Figure 4. Dolly Varden.

-continued-

Figure 5. Coast range sculpin.

APPENDIX C. PROPOSED CREW WORK SCHEDULE

Appendix C1.–Proposed crew work schedule for the Karluk Smolt Enumeration Project.

Employee	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Tech III	0000-0400 1200-1300 2130 - 2359 **7.5**	0000-0530 1200-1400 **7.5**	0000-0530 1200-1400 **7.5**	0000-0530 1200-1400 **7.5**	0000-0530 1200-1400 **7.5**	1200-1300 1800-1900 **RDO** **2**	0000-0530 **RDO** **5.5**
FWT II	0000-0400 1700-1800 2130 - 2359 **7.5**	0000-0530 1600-1800 **7.5**	0000-0530 1600-1800 **7.5**	0000-0530 1600-1800 **7.5**	0000-0530 1600-1800 **7.5**	0000-0530 **RDO** **5.5**	1200-1300 1800-1900 **RDO** **2**
Activities	Dye Test Sample	Sample	Sample	Sample	Sample		

APPENDIX D. TIMESHEET INSTRUCTIONS

Appendix D1.–Instructions for filling out a timesheet.

All ADF&G employees must fill out a timesheet biweekly and these timesheets must be turned in to the Administrative staff in Kodiak in a timely manner. Please follow these instructions when filling out your timesheets to avoid payroll problems. When a flight comes out to drop off groceries, or for any other reason, near the end of a pay period, camp personnel need to send in their timesheets. Fill in the timesheet up to the day you send them in and attempt to project your remaining hours worked.

Fill out each of the following on the top of the timesheet:

Pay period: pay periods start on the 1st or 16th of each month and end on the 15th or end of the month (example: June 1-15 or June 16-30).

SSN: your social security number

Name: full name

Division: Commercial Fish

In the actual timesheet table fill in the following items:

Day: Monday, Tuesday, etc.

Date: 6/16, 6/17, etc.

Hours worked box: start and stop time in military time.

Code 1: fill in the number of hours worked for that day (see example in Appendix G2).

Work hours and Code 1 Totals should both equal the sum of daily hours worked. If your timesheet is sent in before the end of the pay period, project your time for the remaining days so you can total your columns.

Charge to Table located on the bottom left-hand side of the timesheet should be left blank unless otherwise instructed by your project supervisor.

Comments Table located on the bottom right-hand side of the timesheet should be left blank unless otherwise instructed by your project supervisor.

Employee's signature and date: Be sure to sign and date your timesheet.

Crew leaders are responsible for reviewing each crew member's timesheet before sending them to town to ensure that they are properly filled out.

Appendix D 2.–Example of a completed timesheet.

ALASKA DEPARTMENT OF FISH AND GAME Time and Attendance Report

Pay period ending: 6/15/2003 SSN: 191-11-1111 Name: Joe Shmo Division Commercial Fisheries

Record times in military format. Example: 6:00 p.m. = 18:00. If you work past midnight, stop at 23:59 and resume at 00:01 the next day.

Day	Date	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Leave Taken		Sea Duty	Standby	Hazard	Code 1	Code 2	Code 3	Code 4	Holiday / Leave	Work Hrs Total
Sun	6/1	8:00	12:00	13:00	16:30												7.50				0.00	7.50
Mon	6/2	8:00	12:00	13:00	16:30												7.50				0.00	7.50
Tue	6/3	8:00	12:30	14:00	18:00												8.50				0.00	8.50
Wed	6/4	8:00	12:00	13:00	16:30	17:00	19:00										9.50				0.00	9.50
Thu	6/5	8:00	12:00	13:00	16:30												7.50				0.00	7.50
Fri	6/6	8:00	12:00	16:00	19:00												7.00				0.00	7.00
Sat	6/7	8:00	12:00	13:00	16:30												7.50				0.00	7.50
Sun	6/8																				0.00	0.00
Mon	6/9	8:00	12:00	13:00	16:30												7.50				0.00	7.50
Tue	6/10	8:00	12:00	13:00	16:30												7.50				0.00	7.50
Wed	6/11	8:00	12:00	13:00	16:30												7.50				0.00	7.50
Thu	6/12	8:00	12:00	13:00	16:30												7.50				0.00	7.50
Fri	6/13																				0.00	0.00
Sat	6/14																				0.00	0.00
Sun	6/15	8:00	12:00	13:00	16:30	17:00	18:30										9.00				0.00	9.00
																					0.00	0.00
TOTALS															0.00	0.00	94.00	0.00	0.00	0.00	0.00	94.00

EXAMPLE

	Charge to:		
	Notation	CC/LC	%
1			100%
2			
3			
4			
		Total	100%

	Comments		Comments
6/1		6/9	
6/2		6/10	
6/3		6/11	
6/4		6/12	
6/5		6/13	
6/6		6/14	
6/7		6/15	
6/8			

We certify that the information provided above is true and correct.

Joe Shmo Date: 6/15/03
Employee's Signature

Date:
Supervisor's Signature

Date:
Approving Officer Signature

Leave Use Codes

H=Holiday	X=Comp Ann
S=Sick	Y=Comp Pers
A=Annual	C=Court
P=Personal	L=LWOP

**** Premium Pay Codes (PPC)**

110 - Sea Duty	250 - Straight Time
206 - Hazard	251 - Overtime
211 - Standby	

Holiday, Leave, Overtime and Premium Pay Overrides

**Codes	Hours	CC/LC
Leave & Holiday	0.00	No code needed for Leave & Holiday

Ver. 1.9.4
Revised 2/20/99

APPENDIX E. WEATHERPORT CONSTRUCTION INSTRUCTIONS

Appendix E 1.–Instructions for set up of Weatherport.

ALASKA FABRICS, INC. DBA
ALASKA TENT & TARP
529 Front Street - Fairbanks, AK 99701
(907) 456-6328 - Fax (907) 452-5260
1-800-478-8368 (within AK)
E-mail aktent@ptialaska.net
http://www.ptialaska.net/~aktent

INSTRUCTIONS
FOR SETTING UP A
12x PORTABLE BUILDING

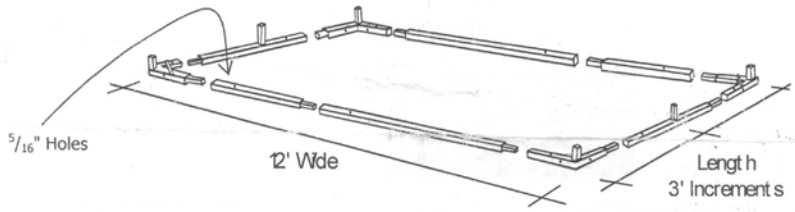
12X

Thank you for purchasing an ALASKA TENT & TARP Portable Building. You should have received five (5) bags:

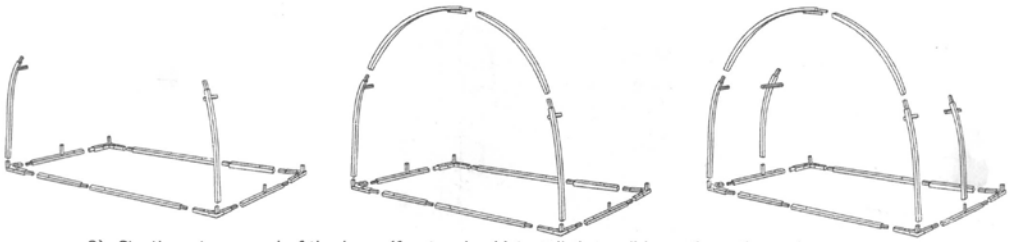
1) Fabric Top Cover and Fabric End Panels
2) Base Frame and Corners
3) Wall Legs
4) Arches
5) Spanners and Augers

Your building has been set-up in our shop. We believe you should have all the correct pieces and parts. (see Parts List) The set-up procedures are as follows:

1) Prepare the building site. If you are building a platform, the finished dimensions are that of the building's footprint. (e.g. 12' x 18' Portable Building fits onto a 12' x 18' platform)



2) Layout the four (4) corners and base pieces and slip fit together. Each base piece has a $^5/_{16}$" drilled through it. These holes are used to anchor the building to a platform (use ¼" lag screws – not included) or to the ground (use nail spikes – not included). Do not anchor the base frame at this time, because the fabric cover and web straps are drawn under the frame.



3) Starting at one end of the base (front or back) install the wall legs, then, the arches – one section at a time. (If you put all the wall legs in first, they tend to torque and stress the base frame)

NOTE: The four (4) wall legs used for the end panels have insert posts that need to point inward. There are two left-hand and two right-hand legs.

The two (2) long arches for the end panels are identical. Since the insert posts are top center, the long arch can go on the left side or the right side, whichever is necessary so that the insert posts point inward.

12xPB-8 Written Instruction

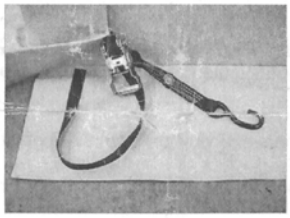
-continued-

7) Your top cover has been fan folded. Standing outside of the building and looking at the front, place the cover outside the building on the ground on the left side and unroll it to the back.

NOTE: We suggest you remove the two ratchets from the edge of the cover that is going to be pulled up and over the frame. If the ratchets are left in place, they tend to get hooked up on the frame and there is the possibility of being hit by them.

Pull the cover up and over the frame. The cover should overlap each end by about six (6) inches.

8) Going inside the building, pull all of the web straps under the base frame and put them into the spring buckles. Leave loose.



9) Anchor the four (4) ratchets. There are several options offered:

a) Anchor the ratchet to the base corner. Using a ¼" x 2" hex cap bolt, through bolt the ratchet to the base corner. You will need to puncture a hole in the fabric wall end for th bolt to go through.

b) Anchor the ratchet to the building platform. Using the grommet that is in the web stra hook, bolt the web strap to your platform.

c) Anchor the ratchet to the ground. Using the augers (provided) screw the auger into th ground and hook, bolt, or tie the web strap to it.

NOTE: In high wind areas it is very important to securely anchor your building to the gro is possible for the building to blow away.